604 UNDERDRAINS

604.01 DESCRIPTION

Work consists of trench excavation, dewatering, furnishing and placing filler materials including fabric if required, under drain pipe, connecting pipe, pipe risers, and backfill. Work includes all pipe connections plus installation and maintenance of shoring as needed to provide the specified trench width. The Contractor shall make the requisite excavations for constructing the underdrain, appertaining structures, and connections and make provisions to maintain and protect fences, trees, underground installations, and other structures. He shall be responsible for the repair of all damage which may result from his operations.

The Contractor shall, after giving due notice to parties affected thereby, provide plank crossings, barricades or other means of maintaining and protecting travel on streets or roads in which trenches are excavated and shall maintain these in good and safe condition so long as may be necessary and shall then remove such temporary expedients and restore such ways to their proper condition.

Work shall include furnishing all materials, tools, labor, and equipment required to fully install and make operational the entire drainage system.

If the Engineer determines that sufficient and proper shoring is not provided, extra shoring shall be installed at the Contractor's expense.

604.02 MATERIALS

Materials shall meet the following requirements:

Pervious fill - 805.02
Underdrain pipe - 808.02(B), 808.03(3) or 809.02
Connecting pipe - 808.01(A) or 808.02(A)
Mortar - 806.05(B)(4)
Backfill material - 804 as determined by the depth
Blanket soils - 805.04
PCC for collar and block - 817, Class F
Pipe risers - 808.02(A) or 808.03(1)
Pipe Jointing compound - 821.18
Cleanouts - cast-iron meeting 815.04, Class 30 (they shall have an adjustable housing with a countersunk cleanout plug and a scoriated Cast Iron cover)
Coarse Aggregate - 805.03
Filter Fabric - 821.11

604.03 CONSTRUCTION REQUIREMENTS

Trenches excavated for underdrains and connector pipe shall be at a minimum depth of 36 inches and a maximum of 42 inches below the top curb, or ground elevation, unless a different depth is specified by the Engineer. The trench width at the bottom shall be a minimum of 24 inches. For underdrain or connector pipe ditches deeper than 42 inches, the minimum trench widths shall be 30 inches as specified per contract plans or by the Engineer. The bottom of the trench shall be covered with a 3 inch layer of pervious fill on top of which a 2 inch layer of No. 67 coarse aggregate on top of which the pipe shall be

placed. The 3 inch layer of previous fill will not be required for connector pipe. Recesses shall be excavated to receive the bells. The pipe shall be laid with perforations down, bells upgrade and spigot ends fully entered into the adjacent bells.

When standard 42 inch trench depth is not sufficient for proper construction, extra excavation of underdrain or connector pipe trenches shall be to limits as directed, extra pervious fill and extra No. 67 aggregate placed and compacted, and payment made under Extra Underdrain Excavation.

If voids are created by the removal of shoring, voids shall be backfilled with previous fill.

After the spigot has been properly inserted into the bell, cold applied mastic shall be applied to either or both ends of pipe to completely fill interior and exterior annular space of joint after jointing is complete. Excess mastic in the pipe interior shall be removed.

Work includes watertight connection to other facilities as needed.

After pipes have been treated with mastic and centered, the remaining annular space shall be entirely filled with mortar. Care shall be taken so that the bottom and sides as well as the top of the joint are properly filled with mortar. If, in the making of any joints, previously completed joints are broken, the broken joints shall be removed and replaced at the expense of the Contractor.

After jointing is approved, remaining coarse aggregate and pervious fill shall be carefully placed and compacted around underdrain or connector pipe until the pipe is completely covered to a depth of at least 6 inches. Remaining trench space shall be backfilled with pervious fill. Blanket soil shall be placed and tamped when soils base is not required.

Mortar and concrete shall be allowed to set before any backfill is placed and before any walking is allowed upon the connections. Care must be exercised so that the pipes, haunches, and bonding are not disturbed.

Each section of the pipe shall have a firm bearing throughout its length and be true to the line and grade required. Underdrains and connector pipes shall be kept free from accumulations of silt, debris, and other foreign matter during their construction and shall be free of such accumulations at the time of their final appearance. Prior to final acceptance, the Engineer may require that the drain system be checked by flushing water through the pipe system. In the absence of a clear free flow at the discharge end, the Engineer shall require replacement of that part of the system not functioning properly.

Where the underdrain is under the roadway proper, or within 3 feet horizontal measure from the backface of curb, pervious fill shall be placed in layers not over 6 inches thick, with each layer compacted by pneumatic tampers to a density as per Table 203.03. When placed in other locations, pervious fill shall be placed in layers not over 12 inches thick and shall be thoroughly compacted by tampering or by approved mechanical means.

Construction methods that disturb, crack, break, or misalign the drain pipe are prohibited.

All junctions, including connections with existing underdrains or sewers shall be made with regular wye connections and sharp turns shall be made with bends. Unless otherwise specified, the top 6 inches of the backfilled trench shall consist of blanket soils thoroughly compacted by hand tampers or by approved mechanical means.

The underdrain shall be so constructed that its final cross-section shall be as follows: From the bottom of the trench to a plane 6 inches below the surface of the ground, the trench shall contain tamped pervious fill, excepting the pipe. The remaining top 6 inches shall contain tamped blanket soils.

The underdrain shall be brought to satisfactory outlets where shown on the plans or as directed by the Engineer. The underdrain shall be connected to outlets by means of ells or wye branches as required.

All sheeting, bracing, and supporting material shall be removed in such a manner as not to endanger the construction, other structures, utilities, or property. The sheeting, bracing, and supporting shall be so removed that no voids are left in the space occupied by it and so that the completed backfill extends horizontally between relatively undisturbed soils.

604.04 MEASURE

(A) UNDERDRAINS AND CONNECTOR PIPES. The unit of measure for Underdrains and Connector pipes will be the linear foot. The number of linear feet will be measured along the center line out of the top of the pipe, complete in place. Measure for underdrain will be made from the spigot end of the pipe where it enters the bell of the fitting for the connecting pipe. When cleanouts are being installed, the measurement will terminate at the riser; otherwise, it will terminate at the end of the pipe. For connector pipe, measure will be made from the outside face of the inlet wall or manhole to the bell end of the connecting pipe where it meets the underdrain pipes.

(B) ADDITIONAL EXCAVATION FOR UNDERDRAINS. The unit of measure for Additional Excavation for Underdrains will be the cubic yard. The number of cubic yards will be computed from the dimensions measured as follows:

Width will be based on width per plans minus standard 24 inch width for the portion of trench to a standard 42 inch depth, plus a width per plans or as directed below the 42 inch depth. Depth will be based on vertical distance from required trench bottom to a plane 42 inches below subgrade, or below lowest transverse elevation at bottom surface of paved and unpaved ditches, or below existing ground elevation as applicable, plus the 42 inch depth for the portion of trench wider than 24 inches.

Length will be based on actual length of extra depth trench.

Extra trench excavation for connecting pipe will be measured as Trench Excavation with measure taken to same limits as stated below for Extra Underdrain Excavation.

(C) UNDERDRAIN PIPE RISERS. The unit of measure of Underdrain Pipe Riser will be the vertical linear foot. The number of vertical linear feet will be measured along the center line on the outside of the pipe.

Measure will be made from the bell end of the underdrain pipe where the elbow fits into the bell to the top of the cleanout plug.

604.05 PAYMENT

(A) UNDERDRAINS & CONNECTOR PIPES. The number of linear feet of Underdrains and Connector Pipes, as measured in 604.04(A), will be paid for at the contract unit price per linear foot, which payment will include excavating to plan depth and width, or as specified herein. This payment will also include disposal of all excess and unsuitable excavated materials, the furnishing, hauling, and placing of all underdrain pipe, connector pipe, and backfill and all labor, materials, tools, equipment, and incidentals necessary to complete the work.

(B) ADDITIONAL EXCAVATION FOR UNDERDRAINS. The number of cubic yards of

Additional Excavation for Underdrains as measured in 604.04(B), will be paid for at the contract price per cubic yard, which payment will include the excavation and disposal of all excess excavated materials, the furnishing, hauling and placing of all materials including additional pervious materials, and all labor, materials, tools, equipment and incidentals necessary to complete the work.

(C) UNDERDRAIN PIPE RISERS. The number of linear feet of Underdrain Pipe Risers, as measured in 604.04(C), will be paid for at the contract unit price per vertical linear foot which payment will include excavation and disposal of excess and unsuitable materials, the furnishing, hauling, and placement of all materials, including the elbow fitting, the PCC blocks, the cleanout box, and all labor, tools, equipment, and incidentals necessary to complete the work.